

# **APPLICATION FOR UNITED STATES PATENT**

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TITLE OF INVENTION

**PASSIVE TRANSFER GUIDE FOR  
CONVEYOR TRACK**

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## **CROSS-REFERENCES TO RELATED APPLICATIONS**

This application claims the benefit of U.S. Provisional Application Serial No. 60/398,893, filed July 26, 2002.

## **STATEMENT AS TO RIGHTS TO INVENTIONS MADE UNDER FEDERALLY SPONSORED RESEARCH AND DEVELOPMENT**

(Not applicable)

## **BACKGROUND OF THE INVENTION**

### **(1) Field of the Invention**

The present invention relates generally to track utilized in an automated clinical laboratory conveyor system, and more particularly to an improved guide apparatus for transferring specimen carriers from one track loop to another.

### **(2) Background Information**

Clinical laboratory testing has changed and improved remarkably over the past 80 years. Initially, tests or assays were performed manually and generally utilized large quantities of serum, blood or other materials and/or body fluids. As mechanical technology developed in the industrial work place, similar technology was introduced into the clinical laboratory. With the introduction of new technology, methodologies were also improved in an effort to improve the quality of the results produced by the individual instruments, and to minimize the amount of physical specimen required to perform a particular test.

Instruments have been developed to increase the efficiency of testing procedures by reducing turnaround time and decreasing the volumes necessary to

perform various assays. Robotic engineering has evolved to such a degree that various types of robots have been applied in the clinical laboratory setting.

The main focus of prior art laboratory automation relied on the implementation of conveyor systems to connect areas of a clinical laboratory. Known conveyor systems in the laboratory setting utilize separate conveyor segments to move specimens from a processing station to a specific laboratory work station. In order to obtain cost savings, one typical scenario called for specimens to be sorted manually and grouped together in a carrier rack to be conveyed to a specific location. In this way, a carrier would move a group of 5-20 specimens from the processing location to the specific work station for the performance of a single test on each of the specimens within the carrier rack.

With the development of new and improved automatic conveyor systems for laboratories and other environments, it is possible to select, track, and convey individual specimens throughout a laboratory for a variety of different testing, while maintaining a priority system for certain types of testing or special urgent requests for a time-specific response. These new automated conveyor systems are of various types and design, but the inventors herein have found that a dual conveyor system, using a pair of parallel conveyor tracks circulating throughout a laboratory, provides the greatest flexibility and versatility. The integration of various track devices with software directing the operation of the conveyor system and the various automated testing stations, has improved both the speed and capability of automated conveyor

systems in recent years.

Track devices form the physical interface between the specimen samples in carriers being directed throughout the system, while the Laboratory Automation System (LAS) database provides direction for the system through its command and control features. The LAS and the various track devices work in combination to direct, manage and track all specimens throughout the system.

The dual-lane conveyors used with the present invention utilize table top chain to transport specimen carriers about a closed loop among various stations. There are several limits in the use of table top chain as the conveyor in an automated laboratory setting. While the total amount of linear feet capable of being driven by a single motor is typically sufficient for most laboratory settings, a track loop cannot contain more than 720° of angles in aggregate. A simple rectangular shape with two 180° corners utilizes a total of 360° of aggregate angles in a single loop. Similarly, a loop formed in the shape of an "L" utilizes 540° of aggregate angle, while a "U"-shaped track uses the maximum aggregate of angles, totaling 720°.

An advantage of a dual track conveyor is the possibility of running the two tracks at different speeds. This permits a specimen to be moved to a "fast track" between various job sites, and to the slower track when awaiting the performance of a desired task. However, with the limitations of the aggregate angles, there is a limit to the flexibility and capacity of a single loop system, even with dual tracks in the loop.

## **BRIEF SUMMARY OF THE INVENTION**

It is therefore a general object of the present invention to provide an improved passive transfer guide for moving specimen carriers from one closed loop system to another in an automated conveyor system.

These and other objects will be apparent to those skilled in the art.

The passive transfer guide of the present invention is positioned in a section of tangency between a first continuous loop conveyor and a second continuous loop conveyor, with a first guide lane for directing a specimen carrier from the first conveyor to the second conveyor, and a second guide lane for directing a specimen carrier from the second conveyor to the first conveyor. The guide includes a horizontally oriented "H"-shaped central member having a pair of upper legs, a pair of lower legs, and a cross-member connecting the upper and lower legs. The upper legs and an upper portion of the cross-member form one specimen carrier-directing lane, and the lower legs and a lower portion of the cross-member form the second carrier-directing lane.

## **BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING**

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which similar or corresponding parts are identified with the same reference numeral throughout the several views, and in which:

Figure 1 is a perspective view of a passive transfer guide of the present invention installed between a pair of conveyor track loops;

Figure 2 is an enlarged cutaway perspective of a portion of the conveyor track;  
and

Figure 3 is an enlarged perspective view of the passive transfer guide.

### **DETAILED DESCRIPTION OF THE INVENTION**

Referring now to the drawings, in which similar or corresponding parts are identified with the same reference numeral, and more particularly to Figure 1, the passive transfer guide of the present invention is designated generally at 10, and is shown installed between two loops of track 12 and 14 of an automated conveyor transport system.

Each loop 12 and 14 is a continuous loop, dual-lane track having integrated continuous loop conveyors 16 and 18 forming an inside lane 20 and an outside lane 22, respectively for transporting specimens within specimen carriers 24. Each loop 12 and 14 is supported above the ground by support frames (not shown) spaced along the track where needed.

Referring now to figure 2, one lane 22 of track 12 is cutaway to show the construction of the conveyor 18 and track 12 in more detail. Conveyor 18 uses a table top chain 26, known in the art, and includes a plurality of plates 28, each having a flat upper surface 30 (or "table top") and a generally "H"-shaped cross-section. A leg 32 of an elongated extrusion 34 projects within each of the notches of the "H" of plates 28, to guide the plates as they are moved. Plates 28 are interconnected by links 36, which permit the plates 28 to pivot about the links 36 within a horizontal plane. The links 36

are engaged by a drive mechanism to pull the chain along the guide extrusions 34 and thereby drive the chain 26. The upper surfaces 30 of plates 28 form a flat planar surface that will transport specimen carriers 24.

A pair of elongated guide rails 42 and 44 are disposed along the lengths of conveyor 18 on opposing sides of the plates 28 to guide the specimen carriers 24 therebetween. Preferably, guide rails 42 and 44 are spaced above extrusions 34 and generally parallel thereto, with smooth vertical surfaces 42a and 44a oriented inwardly towards the plates, against which the sides of the specimen carriers 24 will contact as they are transported on plates 28.

Referring now to Figure 3, passive transfer guide 10 is positioned between loops 12 and 14 and interconnects the outer lane 22 of loop 12 with the outer lane 22' of loop 14. While the passive transfer guide 10 will in most cases be located at the curves of two adjacent loops 12 and 14, it should be noted that the guide 10 may be used in any location where the outer lanes 22 and 22' are adjacent one another with the associated conveyors 18 and 18' traveling in opposite directions. For purposes of clarity, guide rail 42 of loop 12 and guide rail 42' of loop 14 will be denoted the inward guide rails, while the opposing rails 44 and 44' will be denoted the outward guide rails.

Passive transfer guide 10 consists of three general parts: a central member 50 and two inserts 52 and 54. Central member 50 is a generally "H"-shaped plastic piece having two upper legs 50a and 50b, two lower legs 50c and 50d, and a central cross-member 50e. The inward and outward guide rails 42, 42', 44 and 44' of a portion of

loops 12 and 14 are removed at the section of tangency, designated generally at 56, of the conveyors 18 and 18'. These removed guide rails are replaced with the guide 10 as described below.

Upper leg 50a and lower leg 50c of central member 50 are aligned and positioned to continue the inward guide rail 42 of loop 12. Upper leg 50b and lower leg 50d of central member 50 are aligned and positioned to continue the inward guide rail 42' of loop 14. Cross-member 50e has a smooth, arcuate "U"-shaped arch 58 forming the vertical surface extending between the inward surfaces of upper legs 50a and 50b.

Thus, legs 50a and 50b and cross-member arch 58 form a smooth continuous contact surface for a specimen carrier to follow as it travels through the upper portion of guide 10. Similarly, a smooth, arcuate inverted "U"-shaped arch 60 is formed on the vertical surface of cross-member 50e extending between the inward surfaces of lower legs 50c and 50d. In this way, legs 50c and 50d and cross-member arch 60 form a smooth continuous contact surface for a specimen carrier to follow as it travels through the lower portion of guide 10.

Conveyors 18 and 18' are coplanar at the section of tangency 56, so that conveyor 18 will push a specimen carrier 24 into the curved surface of lower arch 60, turning the carrier off of conveyor 18 and on to conveyor 18', moving in the opposite direction. Conveyor 18' will then pull the carrier on through the lower portion of guide 10 and fully onto conveyor 18'. Similar movement occurs in the upper portion of guide 10 along arch 58, from conveyor 18' to conveyor 18.



Insert 52 includes an inverted "V"-shaped guide rail with one leg 52a positioned to continue the lower of the outward guide rails 44 of loop 12, and the other leg 52b positioned to continue the adjacent lower outward guide rail 44' of loop 14. In this way insert 52 and the lower portion of central member 50 form a slot or transfer lane 62 through which a specimen carrier 24 will pass and be guided. Insert 54 includes a "V"-shaped guide rail with one leg 54a positioned to continue the upper of the outward guide rails 44 of loop 12, and the other leg 54b positioned to continue the adjacent upper outward guide rail 44' of loop 14. In this way insert 54 and the upper portion of central member 50 form a slot or transfer lane 64 through which a specimen carrier 24 will pass and be guided.

Guide 10 is passive in that it does not move in order to transfer a specimen carrier 24 from one loop to another. Rather, it is the movement of the conveyors 18 and 18' that actually cause the transfer to occur. Thus, guide 10 has no moving parts, making the apparatus a virtually maintenance-free device.

Whereas the invention has been shown and described in connection with the preferred embodiment thereof, many modifications, substitutions and additions may be made which are within the intended broad scope of the appended claims.